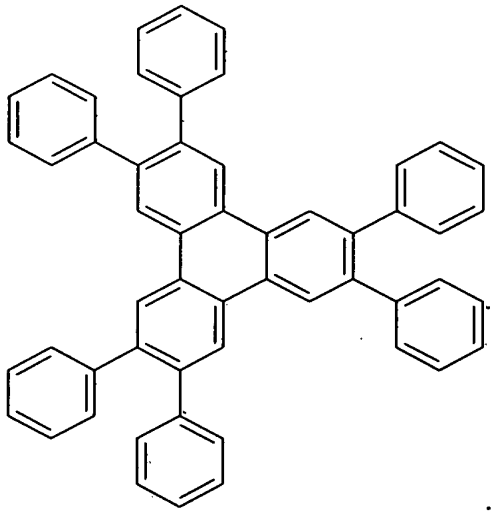
REMARKS

Claims 1 to 50 and 53, as amended, appear in this application for the Examiner's review and consideration. Claims 1 to 50 have been withdrawn, as being drawn to a non-elected invention. Claims 51 and 52 have been canceled by this Amendment without prejudice to Applicants' right to file one or more divisional or continuation applications directed to the subject mater of those claims. The amendments are fully supported by the specification and claims as originally filed. Therefore, there is no issue of new matter.

Claims 51 to 53 were rejected under 35 U.S.C. §112, second paragraph, for allegedly being indefinite for the reasons set forth on page 2 of the Office Action.

In response, Applicants submit that claims 51 and 52 have been canceled, and claim 53 has been amended to recite a compound, having the unsubstituted structure:



Applicants submit that it is clear that the structure recited in claim 53 is closed.

Therefore, the claims particularly point out and distinctly claim the subject matter Applicants regard as the invention. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claims 51 to 53 under 35 U.S.C. §112, second paragraph.

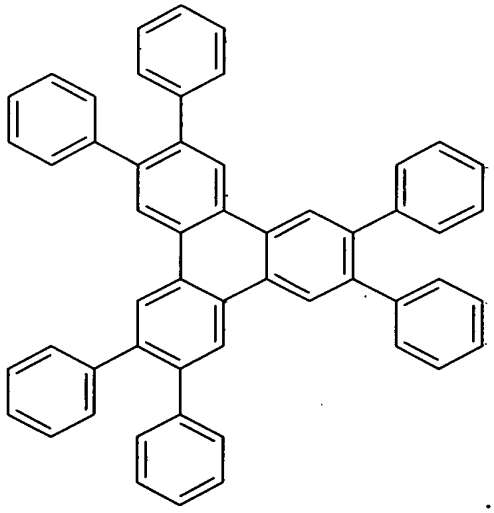
Claims 51 and 52 were rejected under 35 U.S.C. §102(b), as allegedly being anticipated by U.S. Patent No. 5,989,737 to Xie et al. for the reasons set forth on page 3 of the Office Action, and claim 51 was rejected under 35 U.S.C. §102(b), as allegedly being anticipated by U.S. Patent No. 5,281,489 to Mori et al. or U.S. Patent No. 6,150,042 to Tamano et al. or U.S. Patent Application Publication No. 2002/0038860 to Tsuboyama et al. or U.S. Patent Application Publication No. 2002/0064679 to Ishiskawa et al. or U.S. Patent

Application Publication No. 2002/0177009 to Suzuki et al. for the reasons set forth on pages 3 and 4 of the Office Action.

In response, Applicants submit that claims 51 and 52 have been canceled, mooting the rejections of those claims. Accordingly, it is respectfully requested that the Examiner withdraw the rejections of claims 51 and 52 over Xie et al., Mori et al., Tamano et al., Tsuboyama et al., Ishiskawa et al., and Suzuki et al.

Claims 51 to 53 were rejected under 35 U.S.C. §102(b), as allegedly being anticipated by Boden et al., *Liquid Crystals*, 28(1), pp. 139-144 (2001), or Wegewijs et al., *Physical Review B*, Vol. 65, pp. 2451 12-1-2451 12-8 (2002), for the reasons set forth on pages 4 and 5 of the Office Action.

In response, Applicants submit that claims 51 and 52 have been canceled, and claim 53, as amended, is directed to a compound, having the unsubstituted structure:



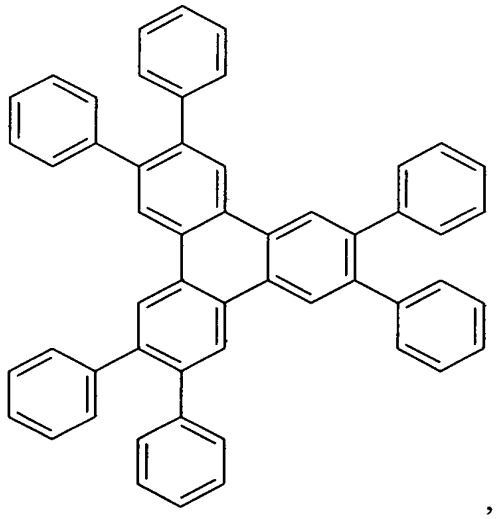
Thus, the compound recited in claim 53 is a substituted triphenylene in which each ring of the triphenylene is disubstituted, and each of the substituents is an unsubstituted phenyl.

In contrast to the presently claimed compound, the phenyl substituents in each of the compounds disclosed by Boden and Wegewijs are substituted.

Therefore, neither Boden nor Wegewijs discloses all of the elements of the presently claimed compound, and, thus, the present claim is not anticipated. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claims 51 to 53 under 35 U.S.C. §102(b) over Boden and Wegewijs.

Claims 51 to 53 were rejected under 35 U.S.C. §103(a), as allegedly being unpatentable over U.S. Patent Application Publications Nos. 2002/0064679 and 2004/0076853 to Ishiskawa et al. (Ishiskawa) and Jarikov, respectively.

In response, as discussed above, Applicants submit that claims 51 and 52 have been canceled, and claim 53 is directed to a compound having the structure



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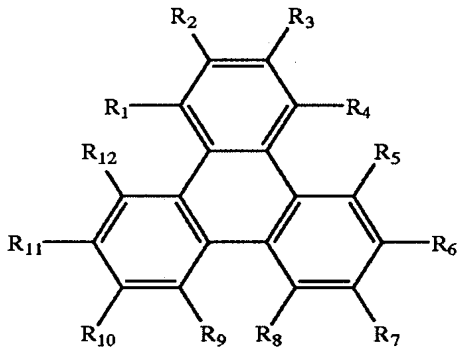
where each of the phenyl substituents is unsubstituted. Applicants submit that the presently claimed compound was not obvious to one of ordinary skill in the art over the disclosures of Ishiskawa and Jarikov at the time of the present invention. In support of this position, Applicants submit herewith a Declaration under 37 C.F.R. § 1.132 of Dr. Raymond C. Kwong, a named inventor of the present application.

As discussed by Dr. Kwong in his Rule 132 Declaration, Ishiskawa discloses an organic electroluminescent device having at least one layer that includes a triphenylene compound of the general formula



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where each of R_1 to R_{12} independently represents a hydrogen atom, halogen atom, hydroxyl group, substituted or non-substituted amino group, nitro group, cyano group, substituted or non-substituted alkyl group, substituted or non-substituted or non-substituted alkenyl group, substituted or nonsubstituted cycloalkyl group, substituted or nonsubstituted alkoxy group, substituted or non-substituted aromatic hydrocarbon, substituted or nonsubstituted aromatic heterocyclic group, substituted or non-substituted aralkyl group, substituted or nonsubstituted

aryloxy group, substituted or non-substituted alkoxycarbonyl group, or carboxyl group, and wherein each of R_1 to R_{12} may be a ring formed by two of the atoms or groups as mentioned herein. Possible R_1 to R_{12} groups include those listed in paragraphs [0027] to [0040] on pages 2 and 5 of the disclosures of Ishiskawa.

As discussed by Dr. Kwong, the clear teaching of Ishiskawa is that the disclosed triphenylene compounds are substituted with a diarylamino group, where the aryl group is substituted with a substituted or unsubstituted styryl group. Ishiskawa, paragraphs [0009], [0013], [0015], [0017], and [0019]. Examples of the disclosed compounds are provided on pages 6 to 11, as compounds (1) to (18). All of the substituents in compunds (1) to (14) are diarylamino groups. All of the substituents in compounds (15) to (18) are styryl groups. None of the exemplified compounds has an unsubstituted phenyl group as a substituent. None of the exemplified compounds is symmetrically disubstituted, as is the presently claimed compound. Therefore, the clear teaching of Ishiskawa is that at least one of R_1 to R_{12} is a diarylamino group where each aryl group has 6 to 20 carbon atoms, and at least one aryl group is substituted with a substituted or non-substituted styryl group.

The disclosure of Ishiskawa provides substituents for an extremely large number of possible different compounds. However, as discussed by Dr. Kwong in the Rule 132 Declaration, one of ordinary skill in the art, following the teaching of Ishiskawa would obtain a triphenylene substituted with a diarylamino and/or a styryl group. Although the presently claimed compound is one of a myriad of possible compounds that could be obtained by picking and choosing from the extensive list of possible substituents provided by Ishiskawa, Ishiskawa does not disclose or suggest anything that would lead one of ordinary skill in the art to obtain the presently claimed compound. That is, Ishiskawa fails to disclose or suggest anything that would lead one of ordinary skill in the art to obtain a triphenylene compound that is symmetrically disubstituted with unsubstituted phenyl groups, as presently claimed. Therefore, Ishiskawa does not disclose or suggest the presently claimed compound, and the present claim is not obvious over that reference.

At page 6, the Office Action states that "one of ordinary skill in the art at the time of the invention would have at one envisaged a phenyl group for an aryl group of from 5 to 30 carbon atoms as taught in paragraph [1452] of Jarikov's publication." However, Jarikov does not disclose or suggest anything that would lead one of ordinary skill in the art to obtain the presently claimed compound, which comprises a symmetrically disubstituted triphenylene in which each of the six substituents is an unsubstituted phenyl.

As discussed in the Rule 132 Declaration of Dr. Kwong, Jarikov discloses a host material for the luminescent layer of material for an OLED. The host material includes a mixture of at least two components, the first of which is capable of forming both a monomer state and an aggregate state. Jarikov, Abstract and paragraphs [0053] to [0056]. The first component is an organic compound, capable of transporting holes, electrons, or both. Jarikov, paragraph [0055]. The first component is capable of forming the aggregate state in either the ground state of the electronically excited state. The aggregate state of the first component results in a different absorption spectrum, different emission spectrum, or different absorption and emission spectra, relative to the absorption and emission spectra of the monomer state, such that the aggregate state can emit or absorb at higher (to the red) or lower (to the blue) wavelengths than that of the monomer state. Jarikov, paragraph [0058]. The luminescence quantum yield of the aggregate state is different from that of the monomer state. Jarikov, paragraph [0059].

As discussed by Dr. Kwong, Jarikov further discloses that materials for the first host component of the luminescent layer include any more or less flat and rigid molecule, or one having a flat and rigid part, where the molecule has a propensity to undergo aggregation, and form an aggregate state. Jarikov, paragraph [0063]. The clear teaching of Jarikov is that molecules for the first component should be flat, and have a propensity to undergo aggregation.

Jarikov provides a list of 39 polycyclic hydrocarbons that are reportedly useful as building blocks and parent structures for compounds useful as the first component. Paragraphs [0064] to [0103]. All of the listed polycyclic hydrocarbons have flat structures. Preferred compounds for use as the first component of the host are listed in paragraphs [0168] to [1296]. The list includes over 1100 specific compounds. Given that Jarikov states

> Essentially any more or less flat and rigid molecule, or one having a flat and rigid part, has a propensity to undergo aggregation and form an aggregate state and as such is included in the list of preferred materials for the first host component of the luminescent layer of this invention,

Applicants have no reason to believe that not all of those compounds have flat structures. See, Jarikov, Paragraph [0063]. That is, all of the atoms of each specifically named compound are believed to be in the same plane, as the compounds comprise fused aromatic rings without any substituents that are not aromatic rings, fused to the other fused rings. The listed polycyclic hydrocarbons include triphenylene and sixteen triphenylene derivatives, having fused aromatic rings. Thus, all seventeen of the triphenylene compounds listed in

paragraphs [0168] to [1296] are flat. See paragraphs [0355], [0357], [0378], [0541], [0571], [0583], [0614], [0641], [0920], [0930], [0956], [0965], [0986], [1178], [1193], [1205], and [1293]. Jarikov also disclose 85 flat heterocyclic compounds. Jarikov, paragraphs [1297] to [1382]. Three of those heterocyclic compounds are triphenylene derivatives. See paragraphs [1347], [1378], and [1379]. Again, all three of those triphenylene compounds are flat.

Structures of compounds that are disclosed by Jarikov as being particularly preferred are listed as the 28 structures (a) to (ab), each with a listing of possible substituents for the R groups. Jarikov, paragraphs [1416] to [1472]. Triphenylene is listed as structure (r) in paragraphs [1451] and [1452], where any of R_1 to R_{12} can be any of 23 individual substituents and/or any two adjacent R groups can form any of 28 different fused ring structures. The same 23 substituents and 28 fused rings are listed for each of the other structures (a) to (q) and (s) to (ab).

Therefore, as discussed by Dr. Kwong, Jarikov discloses an extremely large number of possible compounds, and further discloses that each of the disclosed compounds should be flat and prone to aggregation. Jarikov also fails to exemplify a single compound that has any substituent other than a fused ring or H. That is, every compound disclosed by Jarikov as the first host component is flat.

One of ordinary skill in the art would understand that Jarikov discloses a phenyl as a substituent on a triphenylene ring, but that Jarikov does not provide any reason to obtain the presently claimed compound, which has a total of six unsubstituted phenyl rings, symmetrically distributed at the 2, 3, 6, 7, 10, and 11 positions of the phenylene structure. As the six symmetrically distributed, unsubstituted phenyl rings are not fused to the triphenylene, the presently claimed compound is not flat. The six phenyl substituents of the presently claimed compound will be turned out of the plane of the triphenylene ring due to stearic hindrance between those substituents.

The presently claimed compound also provides unexpected results when used for its intended purpose. As discussed in the Declaration of R. Raymond C. Kwong, submitted herewith, OLEDs comprising the compound of the invention have a higher efficiency, require a lower operating voltage, and have an increased lifetime compared to similar devices that only differ in that a layer of BAlq is used as an enhancement layer instead of the presently claimed compound. Dr. Kwong's Declaration includes data obtained from experiments comparing devices comprising the presently claimed compound to prior art devices comprising BAlq. As stated by Dr. Kwong in his Rule 132 Declaration, prior to the present invention, OLEDs comprising BAlq as an enhancement layer had luminous efficiencies

superior to OLEDs comprising other enhancement layer materials. As demonstrated by the data provided with the Rule 132 Declaration of Dr. Kwong, the luminous efficiency, voltage requirements, and lifetime of the device comprising the presently claimed compound are significantly better than that of the prior art devices. These results would not have been expected by one of ordinary skill in the art following the teaching of Ishiskawa and Jarikov at the time of the present invention.

Therefore, Ishiskawa and Jarikov disclose a large number of compounds that do not specifically include the presently claimed compound. Ishiskawa and Jarikov require substituents or characteristics not found in the presently claimed compound, so that Ishiskawa and Jarikov provide no reason for one of ordinary skill in the art to obtain the presently claimed compound. In addition, the presently claimed compound provides unexpected results for its intended use. Thus, the present claims are not obvious over those references. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claims 51 to 53 under 35 U.S.C. § 103(a) over Ishiskawa and Jarikov.

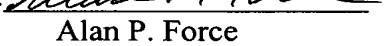
Applicants thus submit that the entire application is now in condition for allowance, an early notice of which would be appreciated. Should the Examiner not agree with Applicants' position, a personal or telephonic interview is respectfully requested to discuss any remaining issues prior to the issuance of a further Office Action, and to expedite the allowance of the application.

A separate Petition for Extension of Time is submitted herewith. Should any other fees be due, however, please charge such fees to Deposit Account No. 11-0600.

Respectfully submitted,

KENYON & KENYON LLP

Dated: April 5, 2007

By: 

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Mark E. Thompson et al.
Serial No.	:	10/785,287
Filed	:	February 23, 2004
For	:	MATERIALS AND STRUCTURES FOR ENHANCING THE PERFORMANCE OF ORGANIC LIGHT EMITTING DEVICES
Examiner	:	Yamnitzky, Marie Rose
Art Unit	:	1774

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF RAYMOND C. KWONG UNDER 37 C.F.R. § 1.132

Sir:

I, Raymond C. Kwong, currently residing at 1 Burr Court, Plainsboro, NJ 08536, hereby declare the following:

1. I am an inventor of the invention disclosed and claimed in the above identified U.S. Patent Application No. 10/785,287.

2. I earned B.Sc. and M.Phil. degrees in chemistry from the Chinese University of Hong Kong in 1993 and 1995 respectively, and a Ph.D. degree in chemistry from the University of Southern California in 2000 under the advisement of Professor Mark E. Thompson, the first named inventor for the above-identified application.

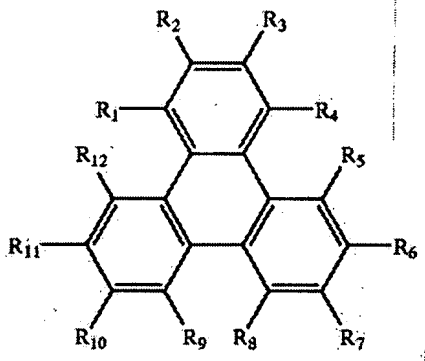
3. I joined Universal Display Corporation (UDC) in 2000, where I currently work as the Department Manager of organic light emitting device (OLED) Materials Applications. At UDC, I lead a research and development team for the development of organic electronic materials for high performance OLEDs.

4. I have over 35 publications and 60 patents and pending patent applications in the field of organic light emitting materials, devices, and fabrication.

5. I am a pioneer in the development of highly stable and efficient materials for phosphorescent OLED applications. My team invented the world's first commercialized phosphorescent OLED red emitter, which won the SID/*Information Display Magazine* Display Material or Component of the Year Gold award in 2003.

6. I have reviewed and understand the Office Action, dated December 12, 2006, and the references cited by the Examiner. I understand that the Examiner has rejected claim 53 of the present application as being unpatentable over U.S. Patent Application No. 09/220,622 to Ishiskawa et al. (Ishiskawa), published as U.S. Patent Application No. 2002/0064679, or U.S. Patent Application No. 10/634,324, to Jarikov, published as U.S. Patent Application Publication No. 2004/0076853. I have read and understand the disclosures of the Ishiskawa and Jarikov applications.

7. Ishiskawa discloses an organic electroluminescent device having at least one layer that includes a triphenylene compound of general formula [1]



> wherein R_1 to R_{12} independently represents hydrogen atom, halogen atom, hydroxyl group, substituted or non-substituted amino group, nitro group, cyano group, substituted or non-substituted alkyl group, substituted or non-substituted or non-substituted alkenyl group, substituted or nonsubstituted cycloalkyl group, substituted or nonsubstituted alkoxy group, substituted or non-substituted aromatic hydrocarbon, substituted or nonsubstituted aromatic heterocyclic group, substituted or non-substituted aralkyl group, substituted or nonsubstituted aryloxy group, substituted or non-substituted alkoxycarbonyl group, or carboxyl group, and wherein each of R, to R,, may be a ring formed by two of the atoms or groups as mentioned herein.

Ishiskawa, paragraphs [0011] and [0012].

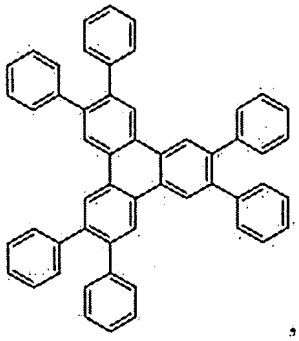
Ishiskawa further discloses over three pages of possible R groups. Ishiskawa, paragraphs [0027] to [0038]. Ishiskawa lists 36 examples of substituted and non-substituted aromatic hydrocarbon groups, including the phenyl group. Ishiskawa, paragraph [0033].

8. However, the clear teaching of Ishiskawa is that at least one of R_1 to R_{12} is a diaryl amino group,

$$-NAr_1Ar_2,$$

where Ar_1 and Ar_2 are each an aryl group having 6 to 20 carbon atoms, and at least one of Ar_1 and Ar_2 is substituted with a substituted or non-substituted styryl group. Ishiskawa, paragraphs [0013], [0015], [0017], and [0019]. In paragraph [0042], Ishiskawa provides 18 examples of triphenylene compounds. Each exemplified triphenylene has 1 to 3 substituents, other than hydrogen, where the substituent is a diarylamino group, a styryl substituted diarylamino group, or a substituted or non-substituted styryl group. None of the exemplified compounds comprises a triphenylene in which a phenyl ring is disubstituted.

9. In contrast to the compounds disclosed by Ishiskawa, the compound of our invention has the structure



and, thus, each phenyl ring in the phenylene is disubstitued with a pair of non-substituted phenyl groups. One of ordinary skill in the art following the teaching of Ishiskawa would not obtain the compound of our invention. Instead, one of ordinary skill in the art would obtain a triphenylene in which each phenyl ring was substituted with, at most, one substituent, where at least one substituent was a diarylamino group, a styryl substituted diarylamino group, or a substituted or non-substituted styryl group. Ishiskawa provides no reason for one of ordinary skill in the art to select the unsubstituted phenyl group as a substituent for triphenylene at each of the R_2, R_3, R_6, R_7, R_{10}, and R_{11} positions of the triphenylene of general formula [1] disclosed by Ishiskawa.

10. Jarikov discloses OLEDs in which the host material includes first and second components, where the first component is capable of forming an aggregate state. Jarikov, paragraph [0010], [0016], and [0056] to [0059]. To form the aggregate state, the first component should have a more or less flat structure. Jarikov, paragraph [0063]. Jarikov discloses over 1300 compounds that can be used as the first component or building blocks for the first component. Jarikov, paragraphs [0064] to [1415]. Jarikov also discloses 28 molecular structures, (a) to (ab), that can be used as the core structure for the first component. Jarikov, paragraphs [1416] to [1472]. Structure (r) is triphenylene. Numerous possible substituents are disclosed for each of the structures (a) to (ab), including the phenyl group.

However, each of the individual compounds disclosed by Jarikov in paragraphs [0064] to [1415] is flat. This includes the 20 triphenylene compounds disclosed by Jarikov in those paragraphs. Therefore, one of ordinary skill in the art, following the teaching of Jarikov, would use a flat compound that could form an aggregate of the type disclosed. One of ordinary skill in the art would not use or add a substituent that adversely affected the desired flat structure. Such a flat structure is obtained with fused aromatic rings.

11. In contrast to the compounds disclosed by Jarikov, the structure of the compound of our invention, illustrated above, is not flat. The six phenyl substituents on the triphenylene will not be in the plane of the triphenylene due to stearic hindrance. In addition, the compound of our invention is not prone to aggregation. Therefore, Jarikov provides no reason for one of ordinary skill in the art to obtain the compound of our invention.

12. The compound of our invention also provides unexpected results for its intended use in an enhancement layer of an OLED, such as, but not necessarily, a hole blocking layer. Prior to our invention, the use of BAlq in an OLED enhancement layer provided the best results. In particular, prior to our invention, BAlq provided OLEDs having a significantly higher luminous efficiency than that of other known materials. Experiments have been conducted by me or under my supervision that demonstrate the superior properties of the compound of our invention for its intended use. The results of those experiments are attached.

13. The experiments compared the luminous efficiency, operating voltage, and lifetime of prior art OLEDs having an enhancement layer comprising BAlq with OLEDs having an enhancement layer comprising the compound of the invention. The devices differed only in the thickness and materials of the enhancement layer. The prior art OLEDs utilized a 100Å thick enhancement layer comprising BAlq. In the OLEDs having enhancement layers comprising the compound of our invention, the enhancement layers were 50 Å thick. The results of tests of the efficiency of the OLEDs clearly demonstrate the unexpected superiority of the compound of the invention for its intended use. As demonstrated by the attached experimental results, the efficiency of OLEDs comprising the compound of the invention in an enhancement layer is significantly superior to those OLEDs utilizing BAlq for the same purpose. Tests comparing the lifetimes of the OLEDs also demonstrate the unexpected superiority of the compound of our invention. The lifetimes of OLEDs comprising the compound of our invention in an enhancement layer are significantly better than OLEDs utilizing BAlq for the same purpose.

14. I affirm that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that those statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

March 31st, 2007

Raymond C. Kwong